Remarks

Claims 1, 2, 14, and 27 have been amended and new claim 34 has been added. Claims 1-34 are pending in the application. Applicant respectfully requests reconsideration.

Claims 1, 14, and 27 have been amended to specify that the rate of correlation loss is determined in a particular direction. Support for this amendment can be found, for example, in the Abstract, which states that the rate of correlation loss is determined in a particular direction, and paragraphs [0031], [0034], and [0035].

Support for new claim 34 can be found, for example, in paragraph [0037], which states that a plane and reference plane can be non-parallel.

Claim Objections

Applicant acknowledges that claim 32 depends from claim 31, and not claim 1 as indicated in the previous response.

Claim Rejections Under 35 U.S.C. 112

Claims 1-33 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject manner which Applicant regards as the invention. More particularly, the Office Action stated that:

> Claims 1, 14, and 27 are directed to determining a rate value by using the correction loss data and lacks clarity as to how this rate value is determined and therefore does not further limit the method, system or the computer.

Claims 1, and 14 have each been amended to recite determining "a first rate of correlation loss between the first and second image in a direction using the first correlation loss data." (emphasis added). The first rate of correlation loss between the first and second image in a direction indicates the rate at which the first and second image loss correlation with each other in that direction. The first rate of correlation loss in a direction is different than a correlation value. This is because a correlation value simply indicates how well two images correlate. A correlation value does not indicate the rate at which the two images loss correlation with each

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other in a given direction. Therefore, the first rate of correlation loss in a direction is different from a correlation value.

An example of how to determine the first rate of correlation loss in a direction is provided in the application. FIG. 5 shows an example of correlation loss data 170 between images 100a and 100c in the direction 140 and correlation loss 160 between images 100a and 100b in the direction 140, where the direction 140 is from left to right in FIG. 3. FIG. 6 shows a function 165 fitted to the correlation loss data 160 between images 100a and 100b. The function 165 fitted to the correlation loss data 160 approximates the correlation loss data 160. The derivative of the fitted function is then calculated. Because the fitted function 160 approximates the correlation loss data, the derivative of the fitted function 160 approximates the rate of correlation loss between images 100a and 100b in the direction 140, i.e., the rate at which the two images 100a and 100b loss correlation with each other in the direction 140 (see, e.g., paragraphs [0028]-[0031] of the application).

Therefore, Applicant submits that the first <u>rate</u> of correlation loss between the first and second image <u>in a direction</u> is clearly defined.

Claim Rejections Under 35 U.S.C. 103

Claims 1-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Ferre et al. (U.S. 5,967,980) in view of Sumanaweera et al. (6,159,152). Applicant respectfully traverses.

Claim 1 is patentable because neither Ferre nor Sumanaweera, taken either alone or in combination, discloses, teaches or suggests determining "a first <u>rate</u> of correlation loss between the first and second image <u>in a direction</u> using the first correlation loss data." (emphasis added).

Ferre fails to disclose determining correlation loss, much less determining a rate of correlation loss in at least one direction, as required by claim 1.

Sumanaweera discloses a system and method of registering ultrasound images. To register a first image relative to a second image, Sumanaweera teaches identifying a feature in the first image, correlating the feature with the second image in various relative positions, and selecting the best correlation value (see col. 1, lines 50-63). The relative motion between the two images is estimated by selecting the translation and rotation for the relative position associated with the best correlation value (see col. 1, lines 63-67). Sumanaweera determines relative

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position by computing correlation values for various relative positions, selecting the best correlation value and then selecting the relative position associated with the best correlation value (see Abstract). In other words, Sumanaweera tries out different relative positions by computing a correlation value for each relative position and selects the relative position resulting in the best correlation value.

Nowhere does Sumanaweera disclose, teach or suggest determining "a first rate of correlation loss between the first and second image in a direction using the first correlation loss data." (emphasis added). As explained above, the first rate of correlation loss between the first and second image in a direction indicates the rate at which the first and second image loss correlation with each other in that direction. In contrast, the correlation value of Sumanaweera indicates how well two images correlate with no indication of the rate at which two images loss correlation with each other in a given direction. Therefore, Sumanaweera also fails to disclose or teach determining "a first rate of correlation loss between the first and second image in a direction using the first correlation loss data," as required by claim 1.

For at least the reasons given above, Applicant submits that claim 1 is patentable, and requests that the rejection of claim 1 be withdrawn.

Claims 1-13 depend from claim 1, and are therefore patentable for at least the reasons given for claim 1.

Claim 2 is additionally patentable because none of the cited references discloses, teaches or suggests "determining a first angle of separation between the first and second images in the direction using the first rate of correlation loss in the direction," as required by claim. An example of this is provided in the application. FIG. 3 shows images 100a, 100b and 100c separated from one another by angles, in which the angle of separation between images 100a and 100b is smaller than the angle of separation between images 100a and 100c. At the intersection line 105, the images 100a, 100b and 100c have high correlation with each other because they are close together. The images loss correlation with each other in the direction from left to right because the distances between the images increases when moving in that direction. FIG. 5 shows the correlation loss data 170 between images 100a and 100c and the correlation loss data 160 between images 100a and 100b, both in the direction 140 from left to right. As shown in the example of FIG. 5, the correlation loss between images 100a and 100b increases at a slower rate

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than the correlation loss between images 100a and 100c in the direction 140 from left to right. This is because the angle of separation between images 100a and 100 b is smaller than the angle of separation between images 100a and 100c (see, e.g., paragraph [0028] of the application). Thus, the rate of correlation loss between two images in a given direction is related to the angle of separation between the two images in that direction. This relationship is neither taught nor suggested by Sumanaweera. Consequently, Sumanaweera does not teach using a rate of correlation loss between two images in a direction to determine an angle of separation between the two images in that direction. Instead, Sumanaweera determines the relative angle between two images by computing correlation values for various translations and rotations between the two images, and choosing the translation and rotation resulting in the best correlation value (col. 5, line 60 to col. 6, line 7).

Claim 14 has been amended to include limitations similar to those of claim 1, and is therefore patentable for the same reasons of claim 1.

Claims 15-26 depend from claim 14, and are therefore patentable for at least the reasons given for claim 14.

Claim Rejections Under 35 U.S.C. 102

Claims 27-31 were rejected under 35 U.S.C. 102(b) as being anticipated by Ferre et al. (U.S. 5,967,980). Applicant respectfully traverses.

Claims 27 has been amended to include limitations similar to those of claim 1, and is therefore patentable for the same reasons of claim 1.

Claims 28-31 depend from claim 27, and are therefore patentable for at least the reasons given for claim 27.

Claims 32 and 33

Claims 32 and 33 were not rejected in the Office Action dated January 30, 2007, as being unpatentable over the cited reference.

Claim 32 depends ultimately from claim 27, and is therefore patentable for at least the reasons given for claim 27.

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Claim 33 depends from claim 1, and is therefore patentable for at least the reasons given for claim 1. Claim 33 is additionally patentable because none of the cited references discloses, teaches or suggests "fitting an exponential function to the first correlation loss data; calculating a derivative of the exponential function; determining an angle of separation between the first and second images using the derivative of the exponential function; and determining the first position data for the second image using the angle of separation." Sumanaweera does not disclose or teach performing any of these steps on its correlation values. More particularly, Summanaweera does not disclose or teach fitting an exponential function to its correlation values, much less calculating a derivative of the exponential function, and determining an angle of separation between the first and second images using the derivative of the exponential function. Further, the Examiner did not address any of these limitations in the previous Office Action.

<u>New Claim 34</u>

New claim 34 depends from claim 2 and is therefore patentable for at least the reasons given for claim 2. Claim 34 is additionally patentable because none of the cited reference discloses or teaches "wherein the first image comprises a first plane and the second image comprises a second plane, the first plane and the second plane being <u>non-parallel to each other</u>." Sumanaweera does not disclose or teach determining a first angle of separation between two non-parallel image planes. FIG. 1 of Sumanaweera clearly shows the images 1-4 being on the same plane. Further, FIG. 1 of Sumanaweera shows two adjacent images 1-4 of overlapping over a region, which requires that their image planes be parallel. In contrast, the method of claim 34 determines an angle of separation between non-parallel image planes, examples of which are shown in FIG. 8 and 9 of the application.

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Conclusion

Prompt and favorable action on the merits of the claims is earnestly solicited. Should the Examiner have any questions or comments, the undersigned can be reached at (949) 567-6700.

The Commissioner is authorized to charge any fee which may be required in connection with this Amendment to deposit account No. 15-0665.

Respectfully submitted,

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